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ABSTRACT

By examining relationships between a host of national policy, domestic economic, media system, and media infrastructure factors, a study assesses possible predictors for videotape cassette recorder (VCR) penetration across 63 countries. Overall statistical results generated through hypothesis testing indicated that these factors were relatively important predictors of VCR penetration in industrialized and less industrialized countries. Specifically, findings indicated that (1) the level of gross national product (GNP) per capita provides the economic basis for VCR diffusion; (2) national TV systems with greater structural and programing freedom, but without a multichannel environment, may encourage more rapid VCR penetration; (3) the number of TV sets available to a population correlates positively with the level of VCR diffusion; (4) although newspaper circulation and telephone penetration are significantly related to VCR penetration, these correlations are largely a function of GNP per capita; and (5) radio use and movie attendance are relatively independent from the acquisition of VCRs because VCR use relies more heavily on TV penetration and its related variables. Results suggested that VCRs may penetrate TV households across nations more rapidly than any other electronic medium in the history of telecommunications. (Appendixes list the low, medium, and high income countries included in the study and provide extensive statistical data.) (JD)

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A QUANTITATIVE ANALYSIS OF WORLDWIDE VCR PENETRATION

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ABSTRACT

Recently, video cassette recorders have become a popular product in many nations around the world. However, the reasons for this global video boom are largely unknown. There appear to be many potentially uneven factors associated with the diffusion of video cassette recorders worldwide. The current study attempts to assess the relationship between all of these potential factors and the penetration of video cassette recorders across sixty-three countries. The overall statistical results generated through hypothesis testing suggest that a number of national policy, domestic economic, national media system and media infrastructure factors are relatively important predictors for the spread of video cassette recorders across industrialized as well as less industrialized states.

INTRODUCTION

Videocassette recorders (or VCRs) have, recently, become a very popular product in many countries around the world. A videocassette recorder's ability to record programs for later viewing and replay pre-recorded programs (e.g. movies, how-to tapes, etc.) at a viewer's convenience has altered the "temporal" nature of traditional television viewing patterns. The VCR owner not only enjoys the viewing time flexibility, he or she also has the access to a variety of program choices that are not available to non-VCR owners.[1]

The technical capability of a VCR to place the "viewing control" heavily onto a viewer's hand has caused some economic, social as well as political concerns worldwide.[2] For instance, in a commercial television system, time-shifting and home recording of copyright materials may create a significant economic impact on the television and the film industry. In a nation that has more rigid social and political restraints on personal expression, the invasion of Western films or entertainment material (e.g. pornography, politically sensitive material) to VCR households may be regard as undesirable by authorities. It is, therefore, not uncommon for nations to impose various restrictions on the import or purchase of VCRs for different reasons.

To better understand this booming global video phenomenon, one may first consider it as a part of the electronic revolution that has facilitated the progress of the information age.[3] Moreover, VCR growth can also be attributed to the advancement in

telecommunications technology. As such, both an individual's access to and demand for various types of information (e.g., data, entertainment, etc.) have been greatly increased. However, unlike the penetration patterns of other kinds of telecommmunications technologies (which generally reach the industrialized nations first and the non-industrialized nations much later), VCR ownership diffuses among different nations around the world in a somewhat unpredictable fashion.

For instance, the penetration ratio in a "media rich" state such as the United States (10.7%, 1983) is much lower than that of Kuwait (92%, 1983) or India (34.2%, 1983)-- the "media poor" states.[4] According to a survey done by Intermedia, industrialized nations don't necessarily have higher penetration rates than the nonindustrialized states.[5] This phenomenon apparently violates the traditional expectation that VCR ownership should first spread among industrialized nations that already have a well developed telecommunication infrastructure in place before reaching the less industrialized states.

Qualitative generalizations and explanations for the problem of this "irregular" penetration pattern are likely to be inaccurate because of the existence of various uneven political, social and economic circumstances among individual nations. It is highly possible that, while some penetration-related factors may apply to certain nations, they are found completely inadequate in other cases. In order to more precisely analyze this problem, the current study will empirically test a number of hypotheses to supplement qualitative explanations with a set of quantitative evidence.

LITERATURE REVIEW

The irregularity of VCR penetration patterns is probably largely a function of national policy, domestic economy, media system and media infrastructure combined. In the following discussion, a host of factors gathered from the literature that may serve as potential predictors for VCR penetration worldwide will be individually reviewed.

Western Industrialized Nations

Among the industrialized or economically developed states, both social science research and market research have revealed some of the underlying reasons for the diffusion of VCRs.

The United States Based on empirical research, major uses of the VCR include time shifting, video-library building (i.e., recording favorite movies or programs for "permanent" collections) and prerecorded-tape viewing.[6] VCR prices have been identified as a major factor associated with the purchase decision. Penetration is found to be highest among pay cable subscribers (twice as likely to purchase a VCR than non-cable consumers and four times more likely to purchase than basic cable subscribers), because these subscribers have additional opportunities for time-shifting and video-library recording.[7] Moreover, it is reported that nearly 75% of home recording among all VCR households is for time shifting purposes; 56% of the VCR owners record movies at a weekly average of 3.3 hours.[8] With regard to VCR distribution across the population, a study indicates that households with middle income and up ($20,000 and up) owned 87% of the VCRs sold in 1982. That figure increased to 90% in 1985.[9]

Home recording of movies or TV programs has raised serious copyright concerns from the movie industry and TV producers.[10] Time-shifting and commercial skipping (i.e., when viewers skip commercials during replay) has also deeply concerned TV advertisers.[11] Although pre-recorded tape viewing has somewhat affected theatre attendance, major movie companies who also supply the majority of the pre-recorded tapes may not necessarily suffer from it. They receive more royalties from video release than from network and cable release.[12] With at least 6,000 movie titles available on tapes, approximately 14,000 video specialty outlets (not including grocery, drugstore, convenience store and department store video stands) and economic rental service, the prospect for pre-recorded tape sales or rental is one of promising. On the whole, VCR sales are projected to experience continuous solid growth as prices continue to decline.[13]

European Nations The picture of VCR penetration in this region appears to be somewhat different from that of the United States. Several unique factors can be found intervening with the distribution of VCRs. For instance, national wealth or GNP per capita may reflect the rates of penetration. In the urban industrialized north, VCR penetration is generally higher: 30.1% in the United Kingdom, 18.5% in West Germany, 20.5% in Norway, and 17% in Sweden.[14] In contrast, in the less industrialized south, VCR penetration tends to be lower: 4.7% in Spain, 6% in Portugal, and 2.4% in Greece.[15] Nevertheless, there are also some unequitable circumstances peculiar to certain countries. For example, France and Austria impose duties and taxes on VCR

purchase and ownership; Portugal, Italy and denmark practice VCR import restrictions or quotas.[16] These levies and restrictions have a net effect on raising VCR sales prices.

However, high prices may affect the market growth unevenly among nations depending on exigencies such as a national policy on VCR costs, media infrastructure and media systems. Market evidence suggests that countries which can continuously lower their VCR costs may expect relatively rapid sales growth (e.g., Sweden, Denmark and Italy) than those who are likely to maintain high prices (e.g. Spain and Belgium).[17] With regard to media infrastructure, the color TV penetration seems to be an important contingent. Countries with a small color TV population ratio such as Spain (15%, 1982) and Italy (35%, 1982) lag behind in their VCR population.[18]

In terms of media systems, the number of channels available to national TV systems help determine the VCR distribution trend. More affluent states with single channel or state-run channels such as Norway and Denmark have much higher penetration rates because viewers tend to look for alternative program options to increase their total program choice (VCRs apparently can help provide alternative program choices). On the contrary, the poorer states with limited programming such as Portugal and Greece, nevertheless, don't seem to react to the lack of multiple viewing environments by rapidly increasing their VCR distribution.[19] On the other hand, in nations with multichannel viewing environments (i.e., multiple TV channels, cable channels, or satellite channels) such as the Netherlands, Sweden and Finland, VCR penetration has shown steady increase. VCR users in these

nations are heavily engaged in time-shifting as well as pre-recorded tape viewing.[20] However, an exception is also found. In Italy, public and private channels combined provide a large number of feature films in their daily schedules. Time-shifting and pre-recorded tape purchases almost seem unnecessary because there are ample opportunities for viewing movies (i.e., mostly American movies) on TV all day long. As a result, there is no well developed software supply system in place; the VCR penetration rate is also relatively low.[21]

The situation in Italy reflects that a sound video software marketing system is closely related to the spread of VCRs; needless to say the available movie titles on tapes. In fact, the gross number of pre-recorded tape sales have created serious legal problems among European countries because most of the pre-recorded tapes in the video market are pirated copies. For instance, nearly 50 percent of the circulating units in West Germany are illegal. That percentage is 70 percent in the Netherlands and 75 percent in the United Kingdom.[22] These nations are currently developing more severe penalities against piracy.

In Europe, economic and legal issues concerning VCR growth in relation to the broadcasting industry are rather different from those facing the United States. As many European broadcasting systems are primarily either state-run or public service in nature, market competition for TV products is not a threat for them. Instead, software piracy problems that have given rise to copyright complaints from the American film industry and national policy on the VCR importation are regarded as more prominent concerns.

Less Industrialized Nations

Among the less industrialized nations, the so-called "oil-wealth" or "newly industrializing" nations, have increasingly become economically competitive with developed nations. In order to more precisely assess all the uneven situations that may affect the prediction of VCR diffusion, these nations are distinguished from those "typical" developing nations.

The Newly Industrializing or Oil-Wealth Nations Several nations come under the label of "newly industrializing." They are--the Republic of China (or Taiwan), Hong Kong, South Korea, Singapore, and Brazil. The "oil-wealth" nations are, namely, the Arab states such as Saudi Arabia and Kuwait. These nations seem to share the following characteristics--a thriving GNP per capita, a rising middle class, a trend toward urbanization and a rapid growth in TV penetration.[23] These economic and media structure factors have contributed to the diffusion of VCRs in those nations. For example, Singapore has a VCR penetration ratio of 62%; that figure is 20% in Taiwan, 24% in Hong Kong, 19.3% in Saudi Arabia, 75% in Qatar and 92% in Kuwait (as of 1983).[24]

Developing Nations To the majority of the developing nations, VCRs are considered as a luxury item. Therefore, when these nations impose import controls or set tariffs on the purchase and ownership of VCRS, their VCR prices often become much higher than those of developed nations. As a consequence, many consumers try to smuggle VCRs across national borders or purchase them through black markets.[25] These two activities have made VCR prices an unstable factor for penetration prediction.

For instance, India (34.2%, 1983) and Sri Lanka (22.1%, 1983) both have a relatively high penetration rate but their VCR prices are very high as well.[26] One reason for this phenomenon is that there there are many illegally owned VCR sets--either smuggled or purchase from black markets. Moreover, software piracy also appears to be a problem in many nations. The other explanation is that VCRs are primarily owned by a small group of wealthy elites who may afford a TV set.[27] This high degree of VCR ownership concentration is, in turn, reflected by a high VCR penetration rate, because penetration figures are normally assessed through calculating the total number of VCR sets belonging to per hundred TV households of a nation. Nevertheless, the concentration of VCR ownership among high income classes in certain nations has been gradually declining. In Egypt, Nigeria and India, VCRs have been acquired by the middle class population. The lower income population has also started to make demands.[28]

VCR penetration is thus apparently related to the overall buying ability of a nation, which is best measured by the GNP per capita.[29] wealthier countries generally have higher penetration rates than less wealthy nations. However, India and Sri Lanka, with their exceptionally high degrees of VCR ownership concentration, provide two contradicting examples. In addition to a nation's overall wealth level, concentration in income distribution is also found to be associated with VCR penetration--the higher the income concentration, the greater the VCR distribution ratio. For instance, 27.4% of the total TV households in the phillipines own a VCR, whereas, its wealthiest 10% households share about 38.5% of its national household income.[30] In

contrast, among the Western European nations that have the lowest concentration ratios of income distribution--West Germany, Norway and the Netherlands--VCR penetration figures are the highest. This contradiction is probably a result of the strong buying ability of large middle classes in these very wealthy Western nations.[31]

There are two exceptions where concentration of income distribution does not seem to predict VCR diffusion. In Brazil, the VCR penetration is at 4.2% but 50.6% of its national household income is shared by 10 percent of the wealthiest households. Similar conditions were also identified in the case of Mexico.[32] This conflicting situation may be explained by the parallelism in media structure found among Brazil, Mexico and Italy. All three nations have a multichannel viewing environment, high VCR prices, and a relatively poor software marketing system, all of which may contribute to slow-down in the diffusion of VCRs.

In spite of this, certain nations with multiple TV channels (i.e., generally belonging to a commercialized TV system) do appear to have higher VCR penetration rates (e.g., Venezuela, 22.9%) as compared to nations with single channel or limited viewing options (e.g., Indonesia, 15.6%; Iraq, 14.3%).[33] However, there are very few nations with a multiple channel system (i.e., Latin American nations by and large). The majority of the broadcasting systems among developing nations are either state-owned and/or state-operated systems or public service institutions under government auspices--which usually provide very limited program choices or channel diversity.[34]

The level of urbanization which directly reflects the living standard of most elites of a nations may also be connected to VCR diffusion. Most elite populations in the developing world tend to concentrate in urban areas. Urban dwelling provides them with better access to modern living facilities such as electricity, electrical appliances and electronic media. Moreover, more modernized or Westernized life styles also help foster more sophisticated demands for entertainment and information among them. As such, VCRs appears to be a relatively desirable item to own. This point can be easily proven by examining countries that have large urban populations such as Peru (66%) and Venezuela (84%)--each has a VCR penetration ratios of 17.1% and 22.9%, respectively.[35] However, in comparison to the industrialized Western European states where urbanization is generally high, the situation reverses. The less urbanized nations such as Norway (54%) is found to have the highest penetration rates.[36] This is probably largely a result of the overall trend towards suburbanization in many of the Western nations.

While larger color TV populations in developed nations are said to be related to higher VCR penetration, this is generally true among the developing nations as well-- except that black-and-white sets replace color sets as the measure.[37] Nevertheless, there are two exceptions. India and Sri Lanka's TV penetration ratios are very low but VCR penetration rates are relatively high. This contradiction is probably, again, a function of the high degree of VCR ownership concentration among elite populations in these nations.

Socialist Nations

VCRs have created an unavoidable dilemma for socialist regimes in terms of national policy on home entertainment. Most nations are afraid of the spread of uncensored use of video hardware and software may damage their domestic film industries and ideological control over their citizens. Although they have adopted severe sanctions against software piracy and black-market trade of software and hardware, these two illegal activities have continued to flourish.[38] In response, most nations have started to deal with the problems created by the video age instead of suppressing them. For instance, the Soviet Union and Poland have begun to manufacture their own VCR hardware and software. VCR imports have been opened up. They have also monopolized the distribution of software to prevent the illegal diffusion of Western films and TV programs. However, VCRs have been priced at an expensive level compared to the average income of a typical citizen.[39]

Regardless of the high prices and multiple restrictions on hardware and software purchase, people in the socialist world desire a VCR as much if not more than people from elsewhere. The VCR is viewed as a tool that may be used to provide both entertainment and information which is unavailable on their state-run TV systems (especially Western films).[40] Organizations ranging from underground groups to the Catholic church have also been reported producing videos to bypass their state's monopoly on information.[41] Even though the demands for VCRs are very high in these socialist nations, the relatively low income and low penetration of TV sets among average households may mean a slow growth for the VCR market.

Overall Assessment

It seems that for each potential VCR-penetration predictor, there may be one or two unpredictable anomolies. These situations are usually caused by certain unique social or economic circumstances explainable through qualitative generalizations. In sum, the major potential predictors for VCR penetration worldwide are: (1) national policy factors--price and import restriction, (2) domestic economic factors--GNP per capita, concentration ratio of income distribution, and urbanization ratio, (3) media system factor--national TV system, the number of TV channels available and (4) media infrastructure--TV penetration ratio and movie-attendance frequency. The contingent predictors for some nations are: the extent of hardware smuggling, black-market trade, and software piracy.

Media infrastructure factors are generally interrelated with each other. The spread of one type of mass medium may facilitate the diffusion of other mass media, provided that economic and social circumstances permit. As such, when audience sophistication in media use increases, the media infrastructure may also become more diversified, and vice versa.[42] Therefore, several additional media infrastructure factors that may precede the adoption of VCRs will be elaborated herein.

Mass media usually diffuse across societies in a certain general pattern.[43] For instance, radio, with its low cost, has been extensively distributed among the better developed nations, and relatively well diffused among the less developed nations.[44] Newspaper circulation, an indicator of the reading culture and literacy level of a nation, generally expands after

radio and movie culture has been in place. But it only centers around the elite populations in the developing world.[45] Lastly, telephones may, as part of the measure for the development of national electronic-media infrastructure (not a mass medium in nature), prevail either before or after TV and VCR sets enter a society.[46] They generally concentrate within the elite segments in developing nations but are distributed among different classes in better developed nations at varying degrees.

The growth of VCR diffusion is related to the soundness of a media infrastructure, whereas, the development of a media infrastructure is largely dependent upon the nature of its national media system. In general, the world media systems can be classified according to the four theories of the press[47] --totalitarian, authoritarian, social responsibility and libertarian--and a fifth theory of the press, tutelary theory.[48] These five general types of media systems constitute a continuum of relative system freedom--with the libertarian system being the most "free" system, followed by social responsibility, tutelary (i.e., a system commonly exists in certain newly democratized states with a dominating party that led the revolutionary victory over the previous dictatorship), authoritarian and totalitarian system, in a descending order.[49]

A libertarian media system generally allows the development of media structure and content with very little constraints from the authority. This type of system only exists in a capitalistic state with well established democratic tradition such as the United States. A social responsibility system, with its emphasis in public service, tends to restrict certain structural and

programming freedoms of the media (e.g., most Western European nations and their previous colonies) for fulfilling certain social or educational purposes.[50] A tutelary system, with its principle of keeping the media from being too critical about the government policy, often places "self-regulating guidelines" for them. Despite of this, media structures are relatively free to evolve as market opportunities emerge. Systems of this kind are often commercialized and belong to the newly "democratic" regimes (e.g, Taiwan[51] as well as Mexico and most other Latin American nations).[52]

An authoritarian system, best exemplified by nations with military governments or dictatorship (e.g., Chile, Argentina, Algeria, Saudi Arabia), is relatively stringent in its tolerance of politically or socially damaging media content or structural development.[53] Nevertheless, the media systems can either be privately owned or state-run. Finally, a totalitarian system, with its belief in using media structure and content to communicate national policy and party propaganda, has little if any system freedom at all. All communist states operate this type of state-owned and -controlled media system.[54]

To summarize, nations with a media system of diversified content, multichannel capacity and sound infrastructure are likely to encourage rapid VCR growth. On the other hand, nations without those system and infrastructure characteristics are even more likely to acquire VCRs to increase their viewing options, if their political and economic conditions permit.[55] In fact, most most media systems in the world don't have diversified content, multichannel capacity or sound infrastructures.

The tradition of mass media research has always treated the media as the cause for social changes or development, whereas media growth and development should be a reciprocal process. Literature has indicated that VCR uses are primarily intended for entertainment purposes, and no government has yet coordinated VCR diffusion into national development plans. This suggests when there is a relatively new medium such as the VCR, the examination of media penetration factors should probably precede development effects. However, the lack of a full-scale study on worldwide VCR penetration, the youth of the medium and the problem of gathering reliable statistics on VCR sales and prices have made such a task relatively difficult. Bearing these caveats in mind, the current study will be exploratory in nature. Nevertheless, a thorough examination of all the possible VCR-penetration factors will be conducted to assess the causal relevance of each factor in relation to VCR penetration.

HYPOTHESES

Twelve main hypotheses and two subhypotheses were generated based on the literature review. These hypotheses are described as follows.

H1 : Lower VCR prices will be positively correlated with VCR penetration.

H2 : The level of import control will be negatively correlated with VCR penetration.

H3 : National GNP per capita will be positively correlated with VCR penetration.

H4 : Urbanization ratio will be positively correlated with VCR penetration.

H5 : Among low income states, higher concentration for income distribution will be positively correlated with VCR penetration.

H5a: Among middle income states, greater concentration for income distribution will be negatively correlated with VCR penetration.

H5b: Among high income states, larger concentration for income distribution will be negatively correlated with VCR penetration.

H6 : The degree of national TV system freedom will be positively correlated with VCR penetration.

H7 : The capacity of TV channel repertoire will be negatively correlated with VCR penetration.

H8 : TV penetration will be positively correlated with VCR VCR penetration.

H9 : Radio penetration will be positively correlated with VCR penetration.

H10: Newspaper circulation will be positively correlated with VCR penetration.

H11: Movie attendance frequency will be negatively correlated with VCR penetration.

H12: Telephone penetration will be positively correlated with VCR penetration.

METHODS

Data Selection

Sixty-three nations were studied (see Appendix 1). Penetration data for all nations (except for Bahrain) were obtained from the report of an Intermedia survey. Bahrain was replaced by South Korea due to insufficient information on other predictors. Various sources were used to compile different types of penetration and economic indices, and media system and infrastructure indicators. These sources include: the EIU Special Report, the World Development Report, the World Radio TV Handbook, the Europa Year Book, and the UNESCO Statistical Yearbook. In addition, two South Korea and Puerto Rico nationals were also interviewed to gather certain statistics unobtainable from published sources.

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Measurement

Fourteen penetration factors or variables were tested. Each of them will be individually defined below.

VCR Penetration Ratio, measured by the number of VCR sets owned by per 1,000 inhabitants of a population, represents a much more precise estimate of VCR diffusion across a nation's population than that measured by using total TV households. The latter measure, highly biased by concentration of VCR penetration among many developing nations, is considered unsuitable for the purpose of this study. Finally, although the penetration data were recorded based on governments' import and export statistics, manufacturer records, trade information, and news media reports, the actual penetration rates for certain nations might have been underestimated. The reason is that the unknown statistics of illegally-owned VCR sets may not be included.[57]

VCR Price may reflect the affordability of a VCR. If a range of prices is obtained, the average of the two is adopted.[58]

Import Control, defined through grouping the various types of controls related to VCR imports (adopted from the Intermedia study) according to the degree of restraint, contains three different levels. The least stringent level of control involves licensing VCR ownership and/or taxing VCR purchase to raise the VCR prices. The medium level of control mechanisms include setting up VCR import quotas to limit the number of VCR imports. The most restrained level of control comprises of the combination of control devices from the other two levels and/or import bans.[59]

GNP Per Capita, the general measure of the overall national wealth, may reflect a nation's general VCR-purchase ability.[60]

Urbanization Ratio, the percentage of urban population of a nation, is also considered to be an indicator of the proportion of the population that may have access to electricity or electronic media such as VCRs.[61]

Concentration for Income Distribution, is a measure of how national income is distributed among the higher income classes. If a nation's distribution of total household income is highly concentrated among the elites, it is indicated by a large percentage of income held by the top tenth percentile of income households. On the other hand, if national household-income distribution is highly concentrated among the elites and the upper-middle class, it is reflected by a high percentage of income controlled by the top twentieth percentile of households. On the whole, the degree of income distribution equality in a population may reveal how a relatively expensive item such as the VCR may effect the market across that population.[62]

Income Category, developed based on reclassifying the categories defined in the World development Report, has three different levels (determined according to the level of national GNP per capita). The Low Income Category includes nations in "low income economies" and "lower middle income economies." The Middle Income Category combines nations from "upper middle economies" and "East European nonmarket economies." The High Income Category contains nations within the "high income oil exporters" group and "industrial market economies."[63]

TV System, determined according to the relative degree of structural and programming freedom, includes three distinctive levels of systems (defined through rearranging the six categories

adopted from the UNESCO statistical Yearbook). Nations with a government-owned system, or a public service system, or a commercial and/or mixed system (i.e., a nation with two or more different systems) are considered to have the lowest, the medium, or the highest degree of system freedom, respectively.[64]

TV Channel Repertoire, represented by the number of TV channels available to a national TV system, is an index of channel and/or content diversity. Presumably, a system with more TV channels may have more diversified program content. However, the degree of diversity is largely a function of the level of relative media structural and content freedom of a national TV system.[65]

TV-Penetration Ratio, measured by the number of TV sets owned per 1,000 people of a population, indicates the degree of diffusion for the electronic video/mass culture in a nation.[66]

Radio-Penetration Ratio, assessed by the number of radio sets owned per 1,000 persons of a population, reveals the distribution of the most fundamental form of media culture in a nation.[67]

Newspaper-Circulation Ratio, estimated by the circulation per 1,000 individuals of a population, depicts the extent of reading culture relative to mass media consumption in a nation.[68]

Movie-Attendance Frequency, reflected by the annual attendance per resident of a population, suggests the popularity of theartre-going and the spread of film culture in a nation.[69]

Telephone-Penetration Ratio, represented by the number of telephone sets owned per 1,000 inhabitant of a population, illustrates one dimension of a nation's overall development in electronic media infrastructure and its progress in modernization and urbanization.[70]

Data Analysis

All of the data were statistically analyzed. Specifically, in order to demonstrate the relationship between VCR penetration and all predictor variables, Pearson correlation coefficients were calqulated across all nations and for nations within each independent income category separately. Correlation coefficients were also computed to explain the interrelationship among all the media infraastructure factors (i.e., TV, radio, telephone, and newspaper circulation and movie attendance frequency) for all nations as a whole as well as for nations within each separate income level. The averages of VCR, TV-, radio- and telephone penetration ratio, newspaper circulation ratio, and movie-attendance frequency were tabulated for all nations combined and for nations within each different income classification to present the relative degrees of penetration among different media.

Lastly, theoretically and/or statistically significant factors were chosen for a multiple regression analysis to interpret the causal relationship between VCR penetration and all relevant predictors. The order of variable entry into the regression model was determined by the relative theoretical significance of each predictor. Ideally, three separate regression models should be constructed to obtain three individual sets of causality results to explain the penetration patterns pertaining to each of the three income categories independently. However, only one overallregression model was tested for all three income categories combined because there were not enough number of nations in each category to formulate three valid individual regression models.

RESULTS AND DISCUSSION

Statistical results for each hypothesis will be discussed in factor groups of national policy, domestic economic, media system and media infrastructure. The statistical significance level for all tests is $p \leq .05$. Results on the correlations among media infrastructure factors, averages of all the penetration ratios, and a regression test will also be interpreted herein. (Appendix 2)

National Policy Factors

Hypothesis 1 Nations with higher VCR prices are found to have lower VCR penetration rates across the population. However, the correlation -.20 is not statistically significant in support of hypothesis one. (Table 1) With regard to the three income categories, it was discovered that among high income states, higher prices do affect the penetration rates (r=-.42). For the middle income states (r=-.03) and low income states (r=.28), prices seem to have little or insignificant effects on VCR sales (these result may contain statistical bias because of the small number of valid cases in these two income categories). (Table 2)

Overall, the results generally suggest that the VCR price is a factor with different levels of importance across nations. For more affluent nations, lower prices contribute to more rapid growth of VCR sales because upper as well as middle classes are both the major consumers. the other hand, in less wealthy middle-income and low-income nations, prices are not as important a consideration because the rich elites can afford high prices. Further verification on this hypothesis using a greater number of nations in each income category will be needed.

Hypothesis 2 The level of VCR import control seems to be irrelevant to VCR penetration (r=.08). The rejects hypothesis 2 (correlations for the three income categories not calculated because of very small case numbers in two categories. (Table 2) Nevertheless, this result has provided three revealing facts. First, taxing and licensing VCR ownership does not prevent people from legally or illegally owning VCRs. Second, VCR import quotas are not intended for limiting the VCR supplies (adopted for limiting the Japanese imports instead) to affect regular demands. Finally, taxes, licenses, and import quotas combined will not restrain the demand for VCRs; legal or illegal means will continue to be adopted for acquiring VCRs.[71]

Domestic Economic Factors

Hypothesis 3 As predicted, greater GNP per capita is significantly associated with higher VCR penetration rates (r=.48). This supports hypothesis. (Table 1) Among the high-income states, GNP per capita does contribute to the spread of VCRs (r=.51), whereas, for the middle-income nations (r=.005) and low-income group (r=-.10), GNP per capita appears to be irrelevant to VCR penetration. (Table 2) Comparing these findings with those obtained in hypothesis 1, a relatively consistent penetration pattern among nations from these three income groups can be found. For the economically developed nations, because national wealth well reflect the buying ability of their large middle and upper-middle classes, it also determines the level of penetration. However, for the less developed nations, while national wealth neither reflects the buying ability of the elites, nor does it predict VCR penetration well.

Hypothesis 4 Urbanization ratio apprears to be irrelvant to VCR penetration (r=.06). This rejects Hypothesis 4. (Table 1) Among the nations from three wealth levels, less urbanized high-income states have higher VCR penetration rates (r=-.46, $p \leq .05$), suggesting that the major VCR owners are suburban middle classes and elites. By comparison, more urbanized middle-income (r=.20, $p \geq !.05$) and low-income states (r=.56, $p \leq .05$) tend to have greater penetration ratios. (Table 2) These results reveal that among the middle-income states, the elites, middle class (the major VCR owners) and certain number of the poor all reside in the cities; thus, urbanization ratio is not well related to VCR diffusion. On the other hand, in the low-income states, urbanized elltes are indeed the major VCR owners. Based on these results, urbanization may still be a faily important factor because it may reflect the extent to which how much modernization could affect the adoption of electronic media among many less industrialized nations.

Hypothesis 5 Among low-income states, the top 10% and 20% income households' shares of national household income and VCR penetration are highly correlated with each other (r=.80 and r=.71, respectively). This suggests that greater concentration of income distribution in a poor nation may predict a higher degree of VCR diffusion among elites. However, the result could be somewhat biased because the number of nations analyzed is too small to generate reliable coefficients. Thus, this hypothesis is supported with reservations. (Table 2)

Hypothesis 5a Among middle-income states, the correlations between VCR penetration and the top 10% and 20% income households' shares of national household income are -.22 ($p \geq .05$)

and -.19 ($p \geq .05$), in that order. Again, biases might have been introduced to the results because of the small number of nations included in the analysis. Thus, this hypothesis is rejected with cautions. (Tabel 2) nevertheless, the finding does imply that VCR penetration may experience greater increases if income distribution is less concentrated among the top elites and the upper-middle class, and better distributed across the population.

Hypothesis 5b Among the high-income states, the top 10% and 20% income households' shares of national household income are negatively and insignificantly associated with VCR penetration (r=-.31 and -.26, respectively). But cautions should be raised against the reliability of the result because the number of nations analyzed is relatively small. As such, this hypothesis is rejected with certain reservations. (Table 2) However, in a general sense, the result reveals that nations with more evenly distributed wealth (or larger middle classes and smaller poor populations) may have higher levels of VCR distribution.

Media System Factors

Hypothesis 6 The capacity of TV channel repertoire is largely irrelevant to VCR penetration (r=.08). This rejects hypothesis 6. (Table 1) However, the insignificant correlation is caused by the intervention of the strong correlations between TV channel repertoire and concentration in income distribution (top 10% and top 20%)--that deflated the value of the correlation. Among the three income levels, similarly nonsignificant results also apply; the correlations are -.03, .25 and .001 for the high-, middle-, and low-income states, repectively. (Table 2)

Hypothesis 7 TV systems with greater degrees of freedom do indicate higher VCR penetration ratios (r=.26). This supports hypothesis 7. (Table 1) For the three income categories, the correlation is not significant for the middle-income states (r=.22), but somewhat significant for the high-income states (r=.28, $p \leq .10$) and low-income states (r=.37, $p \leq .07$). (Table 2) Based on the literature and the coding method of this study, most high-income nations do have less restrained media systems than middle-income nations (mainly newly democratized states or socialist regimes) that allow more rapid VCR diffusion. Among the low-income nations, many systems have fairly comparable levels of freedom compared to the Western systems that they are patterned after, and thus also permit more flexible market growth of VCRs.

Media Infrastructure Factors

Hypothesis 8 TV penetration is found to be positively and significantly associated with VCR penetration (r=.26). Thus, hypothesis 8 is supported. (Table 1) However, a similar result only holds for the low-income states, which show an .86 correlation, whereas, for the middle-income and high-income states, that correlation is -.10 and .20, respectively. (Table 2) These results imply that if TV penetration increases among the major VCR users from the low-income states (the elites) and the middle-income states (the middle and upper classes), VCR diffusion may also increase as long as national wealth permits. On the other hand, while TV penetration increases in a high-income state, it spreads among the lower classes instead (not the major VCR buyers). This may have contributed to the adverse correlation between the TV and VCR penetration ratio.

Hypothesis 9 The correlation between radio penetration and VCR diffusion is not a significant one (r=.12). This rejects hypothesis 9. (Table 1) Among the three income categories, that correlation is .75, -.09 and -.16 for the low- , middle- , and high-income states, respectively. The significant correlation for the low-income states may mean that VCRs probably primarily spread among nations that have a high level of radio diffusion because those nations also have the ability to acquire certain level of TV and VCR penetration (the correlation between radio and TV penetration ratios is .93). The negative correlations for the middle- and high-income states seem to imply that a strong VCR-buying ability is probably more relevant to VCR penetration than either TV or radio diffusion because these nations already have very high levels of radio penetration and relatively strong TV penetration as well.

Hypothesis 10 Nations with greater newspaper circulations appear to have higher VCR penetration rates (r=.25). This result supports hypothesis 10. (Table 1) However, newspaper circulation appears to be a faily insignificant factor after its high correlations with GNP per capita and concentration for income distribution were partialed out. The correlation results for the three income categories seem to have reflected this point. Among the low-income states, the correlation between newspaper circulation and VCR penetration is .67. That correlation for the middle-income states is .10, and -.04 for the high-income states. (Table 2) These findings imply that newspaper is a relatively weak indicator because it is almost very insignificant to the growht of VCR distribution among middle- and high income states.

Hypothesis 11 Although movie-attendance frequency is negatively associated with VCR penetration, the correlation is a non-significant one, however (r=-.10). This rejects hypothesis 11. (Table 1) insignificant correlations were also obtained for nations from all three income categories (r=-.05, r=-.14, r=-.11). (Table 2) However, these results should be interpreted with care because the number of nations from each income category included in the analysis is small. On the whole, the findings weakly link together the decrease in movie-attendance frequency with the increase of VCR distribution.

Hypothesis 12 Nations with greater telephone penetration ratios also have higher VCR penetration rates (r=.59). This supports hypothesis 12. (Table 1) With regard to the three income categories, the correlations between VCR and telephone penetration for the high-income (r=.27), middle-income (r=.38) and low-income states (r=.37) are, nevertheless, not significant. (Table 2) However, these results should be examined with reservations because the small number of nations analyzed in each income category may create statistical biases to inflate the test significance. Moreover, the correlation between telephone and VCR penetration ratios significantly decreases if GNP per capita was partialed out highly correlated with telephone penetration ratio). This finding helps explain why some less wealthy nations with greater VCR diffusion don't always have higher telephone penetration (e.g., Hong Kong), whereas, wealthier nations with higher telephone diffusion don't necessarily have greater VCR penetration (e.g., the U.S.). Telephone penetration ratio, thus, should probably be considered as an unstable factor.

Additional Results

The intercorrelations among media infrastructure factors indicate that except for movie-attendance frequency, all other factors (newspaper circulation, radio, TV and telephone penetration ratios) are highly intercorrelated. (Table 3) This suggests that the growth of one medium may enhance the spread of another medium; except that the popularity of movie-going is relatively independent from the development of a media infrastructure.

In terms of the three income categories, movie-attendance frequency again is not significantly associated with any of the other factors in all three categories. (Table 4) For the high-income states, except for newspaper circulation, the other three factors are significantly correlated with each other. Newspaper circulation probably not only depends on the soundness of the media infrastructure, but also relies on a prevailing reading culture. Among the middle-income states, only radio penetration is significantly correlated with all other factors. Correlations among the other three factors fail to reach significance. This implies that the distribution of radios may affect the diffusion of television, newspapers and telephones. However, penetration growth among television, newspapers and telephones probably won't strongly affect each other. Lastly, for the low-income states, newspaper circulation, TV, radio and telephone penetration are all significantly correlated. These findings strongly indicate that for poor nations, the development of one medium may heavily influence the spread of another medium. As such, radio diffusion probably increases and arrives before the growth of newspaper circulation, television ownership and telephone use in that order.

The estimated averages of VCR penetration ratios along with media infrastructure factors across all nations and for the three income categories are in Table 5. According to the results, it is clear that the high-income nations heavily outnumber the middle-income and low-income nations in every category except for movie-attendance frequency. This seems to suggest that people of wealthy nations don't really rely movie-going for media entertainment because their may be able to afford other alternatives. Moreover, the middle-income nations also show much higher levels of use media use than the low-income nations. This implies that their media infrastructures are much more complete than those of the the low-income nations. On the whole, the results have presented a picture revealing considerable gaps in the develpment of media infrastructures and VCR penetration rates between nations from three different income categories.

Regression Model

Based on the above discussion, regarding the variables not included in the regression model, import control and movie-attendance frequency are not relevant to VCR penetration, whereas, VCR price and newspaper cicrulation appear to be weak indicator. Moreover, concentration for income distribution and telephone penetration ratio are both fairly unstable factors.

The first two factors chosen to be in the regression model, urbanization ratio and GNP per capita (two domestic economic factors), are both important indicators for a nation's overall wealth and modernization--the two general preconditions for VCR diffusion. The next two factors selected to enter the model, TV

system and TV channel repertoire (media system factors) determine the relative channel and program diversity which, in turn, help shape the environment for VCR penetration. The two last factors to enter the equation, TV and radio penetration ratio (media infrastructure factors), may reflect the development of a nation's basic electronic media structure that ultimately facilities the potential VCR diffusion.

The overall regression results indicate that significant R-square values are produced at each of the three entry steps, and the the total variance explained by the model is .37. (Table 6)

Urbanization ratio fails to explain a significant amount of the total variance (B=-.21) because of its strong correlations with GNP per capita (r=.41), TV (r=.53) and radio penetration ratio (r=.49). After controlling for the effects of thsoe three highly correlated variables, urbanization ratio apprears to be negatively and highly insignificatnly correlated with VCR penetration. This further supports the findings of hypothesis 4, which suggests that urbanization is not strongly indicative of VCR diffusion and produces bidirectional correlations among different income categories. On the other hand, GNP per capita, with a significant .63 beta weight, indicates that a nation's wealth level may reflect its citizens' buying ability which in turn is attributable to VCR penetration.

The beta weight produced by TV system is positive and significant (B=.36). This demonstrates that nations with TV systems containing greater levels of structural and programming freedom may also allow more rapid VCR penetration. By the same token, TV channel repertoire, with a negative and significant

beta weight (B=-.31, p≤.02), reveals that TV systems with a less diversified channel environment may facilitate VCR penetration.

TV penetration ratio, associated with a non-significant beta of .21, is short on its ability to explain a substantial amont of the total variance. Judging from the partical correlations between TV and VCR penetration rations controlling for GNP per capita and TV system (highy correlated with TV penetration ratio at r=.44 and r=.33, respectively), the relevance of TV penetration ratio as an iindicator slightly decreased. This explains the reason why an insignificant beta weight was obtained.

Lastly, the negative beta weight (B=-.34, p≤.000) generated by radio penetration ratio is a result of its strong correlation with GNP per capita and TV penetration ratio. Through partialing out those two highly correlated variables, radio and VCR penetration ratios became negatively correlated. This reveals that because of the rather extensive diffusion of radios across nations (in comparison to other media), radio penetration is not a good indicator for the growth of VCR distribution. Moreover, this phenomenon is readily observable among some less wealthy nations that have lower radio penetration but much higher VCR diffusion (e.g., Hong Kong), whereas, some wealthier nations have extremely high radio diffusion but much more moderate VCR penetration (e.g., the U.S.).[73]

Overall, the regression model suggests that GNP per capita is the most important factor associated with VCR penetration. That is followed by the relative structural and programming freedom of a TV systems, the diversity of the TV channel repertoire, and TV penetration ratio. Further, urbanization ratio,

though an indicator of development and modernization, is not strongly relevent to VCR diffusion. Similarily, radio is not a highly precitive factor for VCR penetration. This is probably because VCR use requires access to a TV instead of a radio set; even if many radio owners (in poor or wealthy nations) may afford a TV set, they are not necessarily capable of acquiring a VCR. In sum, it is clear that accounted for by the model was heavily reduced due to the strong intercorrelations among some of the predictors. Moreover, there is probably a curvilinear relationship existing between VCR penetration and the predictor variables. This implies the need for adopting two more statistical techniques--a trend analysis and a path analysis--to facilitate further examination of the causal relations between VCR penetration and its relevant predictors.

CONCLUSION

The overall results generated from this study have provided relatively revealing information for interpreting theoretical assumptions discussed herein. Specifically, the level of national GNP per capita provides the economic basis for VCR diffusion. National TV systems with greater structural and programming freedome but without a multichannel environment may encourage more rapid VCR penetration. Moreover, the number of TV sets available to a population also helps determine the level of VCR diffusion.

The failure for VCR prices to have a significant relation with VCR diffusion is probably a result of insufficient records of VCR prices from the middle- and low-income nations. Similar condition is also found in the case of another variable--concen-

tration for income distribution. Presumably, if more complete data had been gathered for these two predictors, significant statistical results could have been attained to provide a more reliable explanation. Further, the variable import control does not have a noticeable correlation with VCR penetration, suggesting that different levels of import control are not intended to curb the spread of VCRs. Instead, they are primarily developed to meet various economic concerns from nations.

Although newspaper circulation is significantly related to VCR penetration, that correlation is largely a function of GNP per capita. Similarily, the significant correlation between VCR and telephone penetration ratios is also a result of the strong relations between telephone penetration and GNP per capita. Lastly, radio penetration ratio and movie attendance frequency, are not considered to be powerful predictors. Radio use and movie-going appear to be relatively independent from the acquisition of VCRs because VCR use more heavily relies on TV penetration and its related variables.

It is conceivable that VCRs will penetrate TV households across nations more rapidly than any other electronic medium in the history of telecommunications. VCRs, as a medium that alters a viewer's relationship with television, can be used for a variety of communication purposes such as education, instruction, or development projects in general, as well as entertainment. As such, various types of video contents intended for accomplishing different social, political, cultural or development goals may be developed by nations around the world. This, in turn, may generrate a number of new research problems for interested scholars.

This study attempted to assess the possible predictors for VCR penetration through examining a host of national policy, domestic economic, media system and media infrastructure factors. Whether the theoretical and statistical significance of each relevant factor discovered herein facilitates the eventual construction of a formal media-penetration theory yet needs to be determined by future research efforts. Hopefully, the results provided from this exploratory study will stimulate further research in this emerging subjet area.

APPENDIX 1

Low Income Category	High Income Category
Ethiopia	Oman
India	Libya
Tanzania	Saudi Arabia
China	Qatar
Sri Lanka	Kuwait
Pakistan	United Arab Emirates
Indonesia	Ireland
Egypt	Spain
Thailand	Italy
The Philippines	New Zealand
Nigeria	United Kingdom
Peru	Austria
Jamaica	Japan
Columbia	Belgium
Guyana	Finland
Lebanon	The Netherlands
Puerto Rico	Australia
	Canada
	France
Middle Income Category	Germany, Fed. Rep.
	Denmark
Syria	United States
Jordan	Sweden
malaysia	Norway
South Korea	Switzerland
Chili	
Brazil	
Mexico	
Taiwan	
Panama	
Portugal	
Argentina	
South Africa	
Venezuela	
Greece	
Israel	
Hong Kong	
Singapore	
Iran	
Iraq	
Poland	
USSR	

APPENDIX 2

Table 1 Correlations Between VCR Penetration and All Variables

	VCR Penetration Ratio		
	r	p	n
VCR Price	-.20	.134	34
Import Control	.08	.225	23
GNP Per Capita	.48	.001	60
Urbanization Ratio	.06	.329	61
Income Distribution			
Top 10% Households	-.27	.063	33
Top 20% Households	-.24	.092	33
TV Channel Repertoire	.08	.276	61
TV System	.24	.031	61
TV Penetration Ratio	.26	.020	61
Radio Penetration Ratio	.12	.175	61
Newspaper Circulation	.25	.028	57
Movie-Attendance Frequency	-.10	.278	39
Telephone Penetration Ratio	.59	.001	35

**Statistical significance is indicated if $p \leq .05$.

Table 2 Correlations Between VCR Penetration and Other Variables by Income Categories

	Low Income Category			Middle-Income Category			High-Income Category		
	r	p	n	r	p	n	r	p	n
VCR Price	.28	.249	8	-.03	.476	8	-.42	.043	18
GNP Per Capita	-.10	.359	16	.005	.492	21	.51	.006	23
Urbanization Ratio	.56	.010	17	.20	.191	21	-.46	.014	23
Concentration for Income Distribution									
Top 10% Households	.80	.016	7	-.22	.268	10	-.31	.122	16
Top 20% Households	.71	.038	7	-.19	.302	10	-.26	.162	16
TV System	.37	.068	17	.22	.168	21	.28	.100	23
TV Channel Repertoire	.001	.498	17	.25	.137	21	-.03	.448	23
TV Penetration Ratio	.86	.001	17	.20	.193	21	-.10	.320	23
Radio Penetration Ratio	.75	.001	17	.09	.353	21	-.16	.231	23
Newspaper Circulation	.67	.001	17	.10	.352	18	-.04	.434	22
Movie-Attendance Frequency	-.11	.386	9	-.14	.309	14	-.05	.425	16
Telephone Penetration Ratio	.37	.273	5	.38	.124	11	.27	.132	19

**Statistical significance is indicated if $p \leq .05$.

Table 3 Correlations Among Media Infrastructure Variables

	TV Penetration Ratio			Radio Penetration Ratio			Newspaper Circulation			Movie-Attendance Frequency		
	r	p	n	r	p	n	r	p	n	r	p	n
Radio Penetration Ratio	.70	.001	62									
Newspaper Circulation	.57	.001	34	.52	.001	58						
Movie-Attendance Frequency	.02	.460	39	.03	.420	40	.12	.248	36			
Telephone Penetration Ratio	.60	.001	35	.70	.001	62	.60	.001	34	-.21	.160	24

**Statistical significance is indicated if $p \leq .05$.

Table 4 Correlations Among Media Infrastructure Variables by Income Categories

	TV Penetration Ratio						Radio Penetration Ratio					
	Low Income		Middle Income		High Income		Low Income		Middle Income		High Income	
	r	n	r	n	r	n	r	n	r	n	r	n
Radio Penetration Ratio	.93 (.001)	17	.35 (.062)	21	.73 (.001)	24						
Newspaper Circulation	.54 (.013)	17	.07 (.392)	18	.42 (.022)	23	.57 (.008)	17	.41 (.004)	18	.25 (.122)	23
Movie-Attendance Frequency	-.26 (.252)	9	.16 (.294)	14	.10 (.361)	16	-.24 (.267)	9	.35 (.114)	14	-.11 (.345)	16
Telephone Penetration Ratio	.91 (.015)	5	-.06 (.436)	11	.67 (.001)	19	.93 (.010)	5	.50 (.057)	11	.57 (.006)	19

	Newspaper Circulation						Movie-Attendance Frequency					
	Low Income		Middle Income		High Income		Low Income		Middle Income		High Income	
	r	n	r	n	r	n	r	n	r	n	r	n
Movie-Attandance Frequency	-.28 (.233)	9	.36 (.123)	12	-.14 (.310)	15						
Telephone Penetration Ratio	.79 (.058)	5	.14 (.348)	10	.57 (.005)	19	.10 (.469)	3	-.23 (.290)	8	-.33 (.134)	13

**Figures in the parentheses indicate statistical probabilities.

**Statistical significance is indicated if $p \leq .05$.

Table 5 Estimated Averages for VCR Penetration Ratio and Media Infrastructure Variables

	VCR Penetration Ratio		TV Penetration Ratio		Radio Penetration Ratio		Newspaper Circulation		Movie-Attendance Frequency		Teleophone Penetration Ratio	
	sets	n	sets	n	sets	n	copies	n	no./times	n	sets	n
Low Income Category	4.4	17	55	17	192	18	43	17	2.5	10	5	5
Middle Income Category	21	21	209	21	327	21	187	18	5	14	183	11
High Income Category	40	23	342	24	626	24	302	23	.44	16	446	19
All Three Categories	23.3	61	218	62	405	63	190	58	2.5	40	302	35

Table 6 Multiple Regression

VCR Penetration Ratio

	B	R	p	n
Urbanization Ratio	-.21		.124	60
GNP Per Capita	.63		.000	60
		.18	.003	
TV System	.36		.019	60
TV Channel Repertoire	-.31		.006	60
		.32	.000	
TV Penetration Ratio	.22		.186	60
Radio Penetration Ratio	-.34		.048	60
		.37	.000	

**Statistical significance is indicated if $p \leq .05$.

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